

2

DTIC FILE COPY



# AIR WAR COLLEGE

## RESEARCH REPORT

AD-A217 473

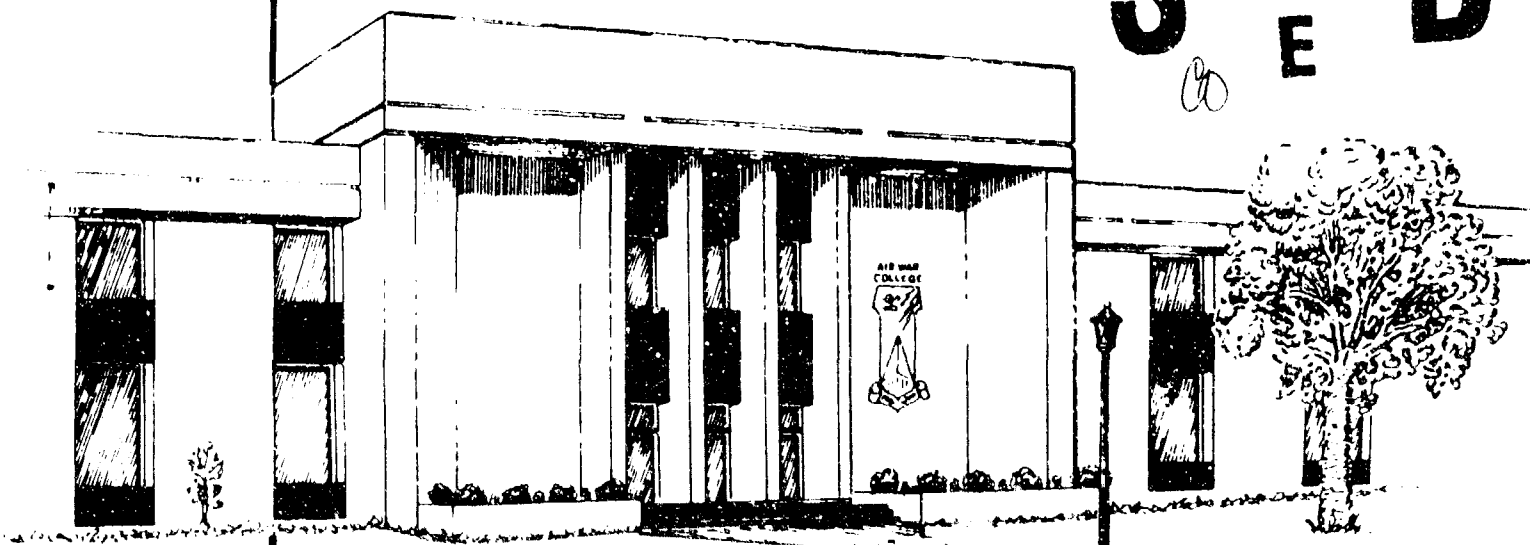
LET'S JOIN THE QUALITY REVOLUTION

LIEUTENANT COLONEL KENTON R. ZIEGLER

LIEUTENANT COLONEL JOHN T. TWILLEY

1989

DTIC  
S ELECTE D  
FEB 05 1990  
E



AIR UNIVERSITY  
UNITED STATES AIR FORCE  
MAXWELL AIR FORCE BASE, ALABAMA

APPROVED FOR PUBLIC  
RELEASE; DISTRIBUTION  
UNLIMITED

AIR WAR COLLEGE  
AIR UNIVERSITY

LET'S JOIN THE QUALITY REVOLUTION

by

Kenton R. Ziegler  
Colonel, USAF

and

John T. Twilley  
Lt Col, USAF

A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY  
IN  
FULFILLMENT OF THE CURRICULUM  
REQUIREMENT

Advisor: Colonel Gary M. Musgrove

MAXWELL AIR FORCE BASE, ALABAMA

May 1989

90 02 03 04

# DISCLAIMER

This study represents the views of the authors and does not necessarily reflect the official opinion of the Air War College or the Department of the Air Force. In accordance with Air Force Regulation 110-8, it is not copyrighted but is the property of the United States government.

Loan copies of this document may be obtained through the interlibrary loan desk of Air University Library, Maxwell Air Force Base, Alabama 36112-5564. (Telephone: [205] 293-7223 or AUTOVON 675-7223).

## EXECUTIVE SUMMARY

TITLE: Lets Join the Quality Revolution

AUTHORS: Kenton R. Ziegler, Colonel, USAF and John T. Twilley, Lieutenant Colonel, USAF

A "Quality Revolution" is occurring in American industry today prompted, primarily, by the necessity to remain competitive in the world market place. The Japanese have led this Quality Revolution by applying managerial and quality principles learned from Americans such as Dr W. Edwards Deming, Joseph M. Juran and others. Although taught by these men, American managers did not generally begin applying their principles until the 1980s. In 1987 the Secretary of Defense published direction to all Services and Defense Agencies to begin applying the principles of Total Quality Management (TQM) in their day-to-day operation. Within the USAF, the Air Force Logistics Command has vigorously applied TQM in all aspects of the command. However, very little application of TQM is evident in the other Air Force commands. A suggested application of TQM principles is presented, aimed at the flightline maintenance activity throughout the Air Force. (S)



<b>Accession For</b>	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
<b>By</b>	
<b>Distribution/</b>	
<b>Availability Codes</b>	
<b>Dist</b>	<b>Avail and/or Special</b>
<b>A-1</b>	

### BIOGRAPHICAL SKETCH

Col Ziegler (B.S., University of Iowa) is an Aircraft Maintenance Officer having served in tactical maintenance positions from the flightline through Deputy Commander for Maintenance at wing-level. He has also served in a Logistics staff position on the Air Staff. He is a graduate of Squadron Officer School, Air Command and Staff College, and Armed Forces Staff College. Colonel Ziegler is also a graduate of the Air War College, class of 1989.

Lieutenant Colonel Twilley (M.A., University of Northern Colorado) is an Aircraft Maintenance Officer having served in a variety of line and staff organizations throughout his career. He has also served in Logistics staff positions on the Air Staff and on the staff of Air Force Logistics Command. He is a graduate of Squadron Officers School and Air Command and Staff College. Colonel Twilley is also a graduate of the Air War College, class of 1989.

## TABLE OF CONTENTS

CHAPTER		PAGE
	DISCLAIMER. . . . .	ii
	EXECUTIVE SUMMARY . . . . .	iii
	BIOGRAPHICAL SKETCH . . . . .	iv
I	INTRODUCTION. . . . .	1
II	MAINTENANCE QUALITY TODAY . . . . .	6
III	THE AGE OF QUALITY. . . . .	18
IV	DOD BUYS INTO QUALITY . . . . .	29
V	IMPLEMENTING TOTAL QUALITY MANAGEMENT AT THE FLIGHTLINE LEVEL. . . . .	37
VI	RECOMMENDATIONS . . . . .	53
	LIST OF REFERENCES . . . . .	57

## CHAPTER I

### INTRODUCTION

"Quality" is one of the most popular catch words today. U.S. industries are stressing improved "quality" in the manufacture of their products, which must compete in the open market against Japanese, German, and other international goods famous for their extraordinary "quality". The competition is intense. The effort to improve "quality" is changing the manufacturing processes used by industry, and is clearly reflected in the advertising campaigns of major U.S. and international companies. At Ford, "Quality Is Job 1". At Quaker State, "The Q Stands for Quality". If you make Zenith television sets, "The Quality Goes in Before the Name Goes On". Chrysler chairman, Lee Iacocca, has issued a "Buyers' Bill of Rights" that says buyers have a right to top quality cars that look good, drive smoothly, and don't break down. The leadership in America's large companies appears to be committed to improving the "quality" of American-made products across-the-board. This effort is a matter of survival in many cases, for without better "quality", America's share in the market place will continue to decline. Such a decline would have a tremendous effect on the ability of the United States to overcome its foreign trade imbalance and its ability to reduce the growing national debt. Based on sales improvements and consumer

reports, industries' efforts to raise "quality" appear to be working. This paper will investigate the methods private industries are using to improve production processes, and the ways they are attempting to improve the "quality" work of their employees. We will then try to relate that to the efforts on-going within the U.S. Air Force to improve the "quality" of work done in the aircraft maintenance area. Specifically, we hope to give maintenance leaders at the flightline level a guide to improve maintenance "quality" performance and production by applying successful techniques used in industry today.

It would be inaccurate to say that our Air Force has a bad "quality" program. Efforts by our technicians, supervisors, and Deputy Commanders for Maintenance (DCM) in all the commands have helped improve readiness rates of aircraft across-the-board. The decade of the 80's saw dramatic improvements in the reliability, maintainability, and sustainability of the fleet. Headquarters Air Force initiated a project named R&M 2000 (Reliability and Maintainability 2000), to look into the future in an effort to improve the reliability and maintainability of current and projected weapon systems. Funding for spare parts, incentives for manufacturers to build reliable products, and an intentional effort by the weapon system acquisition community to make reliable performance a part of each contract all played roles in helping to improve readiness



rates. Spare parts purchases from significantly improved funding in the early 80's helped overcome dismal parts availability and dangerously low readiness rates from the 70's. System Project Offices, responsible for purchasing new weapon systems for the Air Force, included reliability and performance standards in the specifications sent to manufacturers. Dollar incentives were awarded to manufacturers whose product performance exceeded specification standards. As a result, older systems like Air Training Command's (ATC) T-37's and T-38's were able to produce sufficient sorties to train new pilots. Tactical F-15's, F-16's, and A-10's ended 1988 with mission capable (MC) rates approaching 90%. These rates compare with MC rates in the 60%-70% range during the 1970s. These MC rate improvements are important because they equate to better combat capability. Compared to 70% rates in the 70s, a typical 72 aircraft F-16 wing with a 90% MC rate in 1988 has fourteen more combat capable aircraft available everyday to meet training sortie requirements, to fly combat missions, or to deter a potential enemy from initiating hostilities.

The concern is that the superior funding support the Air Force has had for spares, for reliability incentives, and for acquisition program specifications is diminishing as we enter the 1990's. The Air Force is entering a period where maintenance people on Air Force

flightlines will be expected to maintain high standards and 90% MC rates but with fewer spare parts and reduced funding for SPOs and AFLC as they attempt to buy reliable new systems and parts. Efforts to keep high readiness rates will put pressure on technicians and their leaders to "do more with less." In such an environment, "working harder and smarter" will help, but may not be enough. Adding true "quality" to the "harder and smarter" equation may be one of the answers.

But, "quality" doesn't just happen. Producing "quality" work, whether on the Air Force flightline or in the nations' manufacturing plants, requires a sincere, dedicated, intense effort that must be guided and directed through a well-thought-out "quality" program. Is the Air Force prepared to improve "quality"? Does the Air Force understand how industry has applied "quality" principles and processes to improve their products? Or does the Air Force maintenance community need a fresh start in its efforts to improve the "quality" of its aircraft maintenance on the flightline and in shops at wing-level?

Today, "quality" is expected to be a side-benefit that results when technicians perform by-the-book. On flightlines and in the maintenance shops, the focus of supervisory attention is on getting the people to follow the steps spelled out in Air Force job guides and technical data. Very little emphasis is placed on getting

maintenance technicians to recognize that they are the keys to producing "quality" maintenance. Air Force maintenance organizations follow the age-old practice of having Quality Assurance (QA) personnel inspect completed tasks to see if the work meets acceptable standards. Inspecting-in "quality" simply doesn't work. The thesis of this paper is that "quality" must be ingrained in the minds and attitudes of technicians "before" they do maintenance. If "quality" isn't built in, it is certain that inspectors will find less than acceptable work when they inspect at the end of each maintenance task, resulting in work having to be completed again at a considerable cost in terms of readiness and efficiency. What has caused the Air Force to come to rely on inspectors for "quality"? What do the regulations say? Is there sufficient direction and guidance in the regulations to put the proper focus and emphasis on "quality" as the responsibility of the worker, not just the inspector?

## CHAPTER II

### MAINTENANCE QUALITY TODAY

A review of USAF regulations and manuals effecting aircraft maintenance shows that the guidance effecting "quality" work performance has changed very little since the 1960's. AFR 66-1, today as then, stresses maintenance organization, elimination of non-essential, non-productive procedures, and attempts to guide maintenance leaders to a balance between peacetime efficiencies and wartime requirements. While all of these organizational requirements are valid, the requirement to perform at a "quality" peak is almost non-existent. Performance of "quality" maintenance, or the mention of "quality" does not occur until paragraph 1-5 which says,

Equipment readiness is the maintenance mission. Maintenance must keep Air Force equipment in serviceable condition, safely operable, and properly configured to meet mission needs.... In the long term, quality maintenance will prolong equipment service life and reduce defense costs. (1:5)

The primary focus of Chapter 1 of AFR 66-1 is on serviceability, safety, and operability, and stresses that "maintenance personnel will identify changing needs in the areas of personnel (quality, quantity, and qualifications), equipment and sub-system technology (reliability, maintainability, and supportability)." Since AFR 66-1 establishes maintenance management policy for the Air Force, and is the principle source document for the major

commands to develop specific command-unique guidance on aircraft maintenance, it reasonably follows that emphasis on the requirement to perform "quality" maintenance should be up front. It is not.

The second chapter of AFR 66-1 lays out specific responsibilities, by position, for producing maintenance. "Quality" is not mentioned at all as a responsibility for AF/LEY, the Director of Maintenance and Supply for the Air Force. AF/LEY is responsible for developing and publishing basic maintenance guidance. Equally as interesting is the failure to mention "quality" as a responsibility for the Wing Commander or his Deputy Commander for Maintenance (DCM). In fact, "quality" isn't mentioned in Chapter 2 until paragraph 2-7A, which says,

The quality program will evaluate safety, personnel qualifications and performance, and equipment condition. The program will identify problem areas and underlying causes and recommend corrective actions.... The quality program should result in high efficiency maintenance production and equipment reliability. (2:11)

The direction is on "quality" as an inspection program, not on "quality" as an integral part of each technician's daily responsibilities. Sub paragraph (4) gets to the heart of it by stating, "All maintenance personnel are responsible for safety, quality, and reliability, and are accountable for their actions." (3:11) It is apparent that "quality" is not emphasized in the Air Force's primary maintenance guidance to the degree that industry highlights it, and is

an inspection program rather than a deliberate program designed to ingrain "quality" as a prerequisite for maintenance personnel at all levels.

What AFR 66-1 does emphasize are the organizational structure and responsibilities of the DCM's Quality Assurance division.

...The primary role of QA is to determine aircraft equipment condition and personnel proficiency including quality of training as directed by the DCM.... The majority of QA resources will be used to assess and compile condition summary reports to the DCM, on subjects specified by the DCM. (4:21)

This emphasis drives Air Force maintenance organizations to the quality inspection business, at the wrong end of the maintenance process. Inspections occur after a maintenance task has been performed, after the technician has done his job, after he has performed high "quality" or low "quality" work. In short, "quality" is a by-product of the current system, not the foundation of it.

Based on AFR 66-1, the Major Commands develop specific regulations tailored to each command's mission, aircraft types, and wartime responsibilities. As a result, Strategic Air Command (SAC), Military Airlift Command (MAC), Air Training Command (ATC), and the Tactical Air Forces (TAF) have their own versions of 66-1. Each command's emphasis on "quality" maintenance is discussed in the following paragraphs.

MCR 66-5 (Multiple Command Regulation 66-5) is used by the TAF, which includes Alaska Air Command, Air Force

Reserves, Pacific Air Forces, Tactical Air Force, and United States Air Forces Europe. MCR 66-5 decentralizes maintenance in an effort to form autonomous aircraft maintenance units (AMU's) capable of independent support for a fighter squadron, whether that squadron is operating at home-base, or deployed. Decentralization is necessary in the TAF because many fighter squadrons deploy from home-base to forward locations during times of increased tension or conflict. This mobility requirement causes tactical units to be autonomous and their organization in peacetime to reflect how they are organized to fight in wartime. The first mention of "quality" in MCR 66-5 is in paragraph 1-3.

...Quality Assurance Program (QAP) goals include improving technician competence and the quality of maintenance. Improved maintenance is achieved by training the technician to use standard maintenance practices, by requiring compliance with technical data, and by periodically evaluating people and hardware....  
(5:1-1)

As in AFR 66-1, MCR 66-5 has buried the requirement for "quality" maintenance. Paragraph 1-18 says, "Personal integrity and discipline are the cornerstones on which quality maintenance rests. Individuals are responsible and accountable for their actions." (6:1-5) The DCM and his key managers are responsible to "make sure that maintenance performed is timely and of high quality." (7:2-1) Finally, paragraph 4-1 says, "Quality maintenance is the responsibility of individual maintenance technicians, supervisors, and commanders." (8:4-1)

MACR 66-1, Vol 1, gives maintenance guidance to MAC units. MAC maintenance is centralized, reflecting an organization which remains at home base while MAC aircraft fly to enroute bases. MAC's maintenance policy says, "The key to mission success is the sustained ability to provide safe, reliable and properly configured equipment at the time and place it is needed." (9:1) To achieve this, the DCM focuses on Mission Capable rates, time constraints, people and materials, unit resources, and Limiting Factors (LIMFACS).

Quality is achieved by using the maintenance management system in this regulation and through a program set up to evaluate the quality of maintenance at unit level. The objective of the program is to improve technician competence and quality. The objective is realized by training the technician to use standard maintenance practices and strictly comply with technical data and by periodically evaluating personnel and hardware with highly qualified technicians. (10:2)

MAC's focus is on following technical data and implies that quality maintenance will automatically result if technicians follow the book.

One positive aspect of MAC maintenance policy, like the TAF, is that it focuses on the role that maintenance training plays in producing quality oriented technicians. "Maintenance Training is an essential element in keeping and improving the equipment maintenance capability of the unit and is one of the most significant responsibilities assigned to maintenance managers and supervisors." (11:4) This emphasis on training gets to the heart of this paper;



training is the foundation in a maintenance person's development where "quality" must be emphasized and ingrained.

ATC maintenance is becoming unique in the Air Force as it is gradually being performed by commercial contractors rather than by blue suit Air Force technicians. ATC, like MAC, focuses on following the book, with "quality" as a result rather than as a process. ATCR 66-1 says, "...Firm maintenance discipline and strong quality control programs are needed to ensure adherence to technical data and directives." (12:1) Supervisors have the primary responsibility for getting their people to perform quality maintenance. The ATC maintenance leaders that were interviewed by the authors are convinced that commercial contract maintenance teams will provide "quality" work because their technicians will be experienced and highly skilled. Whether "quality" goals and standards will be part of the contractual requirements at each ATC base is still being negotiated by the command.

Of all the command regulations reviewed, SACR 66-9, VOL 1, puts the most focus on "quality" at the very beginning of the regulation. Paragraph 1-3, "MAINTENANCE QUALITY", says,

The objective is to improve technician competence and hardware quality. This objective is realized by training the technician to use standard maintenance practices and strictly comply with technical data, and by periodically evaluating personnel and hardware with

highly qualified technicians. The successful combination of training and verification is necessary to meet command quality objectives. (13:1-1)

SAC also charges the DCM with responsibility for the wing-level "quality" program. The DCM will "ensure that a progressive training program is provided within the maintenance complex emphasizing quality training." (14:2-1)

In Chapter 4, which covers the Quality Assurance function,

Maintenance quality and reliability is the responsibility of all maintenance personnel. The combined efforts of quality assurance personnel, maintenance supervision, and technicians are necessary to ensure high quality maintenance production and equipment reliability. Maintenance supervisors are responsible for safety of flight, safety of equipment operation, and quality maintenance production. The Quality Assurance staff evaluates the quality of maintenance done in the maintenance organization, and performs the necessary functions to manage the organization's QA program. (15:4-1)

And finally, under SQUADRON MAINTENANCE, SACR 66-9 says, "The squadron's main objective is to perform quality maintenance to accomplish the mission." (16:1-2)

SAC guidance falls short, just as the rest of Air Force guidance on "quality", by spreading the responsibility to "everyone" in maintenance but failing to give technicians, supervisors and DCMs' a solid, organized, well-thought-out "quality" program. Too much emphasis is placed on inspecting work after it has been accomplished. This approach in effect relieves the worker/technician from responsibility once the QA inspector puts his stamp of approval on the work.

After reviewing the guidance in Air Force and Command maintenance regulations, representatives in each command headquarters were interviewed. These interviews were conducted by telephone in an effort to determine if there are any current initiatives underway to improve on, or stimulate "quality" maintenance. In general, all those interviewed were concerned that maintenance technicians on today's flightlines are not aware of their ability to put "quality" into their work.

At Headquarters Tactical Air Command, Col Dave Butler, TAC/LGQ, and Capt Frank Bruno, the command's focal point for maintenance training, talked about the lack of adequate training new maintenance people get as they go through technical training centers. The current training syllabi have evolved after years of pressure from the operating commands to shorten the time that Air Training Command has with new airmen. Courses in the training centers are now so condensed that very little basic maintenance is taught in formal schools. The majority of practical maintenance skills are taught at wing level where apprentice technicians, called "three-levels", are enrolled in "maintenance qualification training and on-the-job training" immediately on arrival. The challenge for these young technicians is immense, for they must learn about the Air Force, their new command and wing, and develop their own technical maintenance skills all under the pressures of

a new place with new people. Too often, basic airmen are overwhelmed by all the responsibilities they have to face in their initial operational assignment. Unfortunately, efforts by wing maintenance training personnel and flightline and shop supervisors to train new people are diluted by pressures to produce sorties in support of the wing's mission. As a result, training takes a back seat to production, and "quality" becomes an inspection that somebody else does, not the work that an individual performs.

TAC is working with ATC on a new approach to do more and better training in the technical training centers. This ATC initiative is called "four-level" training, and is designed to keep students at the technical schools for a longer time in order to give them in depth courses in their specialties. Capt Bruno plans on the "four-level" being trained sufficiently in his or her specialty to be able to go to work right away after arriving at a new wing. TAC is also developing a formal "continuation training" program that will have time-phased training events throughout a technician's career. This new program is designed to move away from the current "on-the-job-training" program which is not effective because it relies on flightline supervisors to act as instructors. Flightline supervisors are often the most highly skilled technicians in a wing.

but are primarily tasked with maintenance production and have little time to act as instructors.

MAC, like TAC, is focusing on maintenance training as a way to improve "quality" in the command. Col Walt Turk, MAC/LGM, and Col Dave Davis, MAC/LGMW, are convinced that training is the key to higher "quality" performance on the line and in the shops. But while TAC works with ATC to build a "four-level" training program, MAC is building a stronger wing training program. New technicians are assigned to the Maintenance Training Division for their first four months after arrival at a typical wing. During this four months, the technicians complete their "five-level" training and attend all base recurring training before going to the flightline. MAC leaders are concerned that the current system cheats technicians out of good training at the technical training centers by gradually reducing funding for ATC, thereby eliminating "quality" training. Col Davis is convinced that, "Quality is not a big decision. It is an accumulation of little decisions to do each job right the first time." The ability to do the job right depends on "quality" training and the recognition that each technician has the responsibility for producing "quality" maintenance every time he does a job.

Col Ed Benjamin, ATC/LGM, and Capt Boatman at ATC were interviewed after hearing TAC and MAC concerns about

training. Both said that ATC is attempting to pull training back to the technical training centers. They feel that the current system of sending QA inspectors to the line to inspect work relieves the technicians of responsibility and places the burden on the inspector. Capt Boatman is convinced that the first breakdown in "quality" occurs when the new "three-level" hits the flightline and his supervisor/trainer tells, "how we do business here". ATC is counting on the Rivet Workforce program to improve the overall technical skills and "quality" of work performed by maintenance technicians in the future. Rivet Workforce is an Air Force program that will keep maintenance technicians dedicated to a specific weapon system-type from the time he finishes technical school until he reaches the rank of senior master sergeant. This dedication should produce real expertise throughout the maintenance community.

In summary, research of the basic guidance for Air Force aircraft maintenance organizations shows a lack of focus on "quality". Air Force regulations do not provide enough direction for major commands or DCM's to develop meaningful, clear-cut programs. As a result, maintenance technicians do not have a strong sense of personal responsibility for doing "quality" work on each job and are not trained in techniques that will improve their performance. In the next chapter, some of the programs and

techniques being used in industry today to improve  
"quality" will be analyzed, discussed, and reviewed.

### CHAPTER III

#### THE AGE OF QUALITY

As was said earlier in this paper, "Quality is Job 1!" has been the commercial slogan for the Ford Motor Company for the past 6 years. That slogan speaks for many American companies in the 80s as they struggle to remain competitive in today's world market. What has driven this struggle is the loss of world market share, on a relative basis, to non-American companies. The Japanese are held as the model in economic competition, management innovation, and product "quality". Yet 30 years ago to purchase a Japanese product was a signal that one was buying a cheaply made, poor quality, flimsy item. What has caused this turnabout in Japanese goods and the world's perception of them? This Chapter will concentrate on one aspect of that turnabout and examine the causes, proponents and principles of the "quality" factor in Japanese economic successes.

After the devastation Japan suffered in World War II, her industries were in ruin and many of her people were both without work and home. As her economy began to recover key government and industry leaders began a partnership which included inviting foreigners to Japan to listen and learn from their expertise in business affairs. Among those who went to Japan in the early 1950s was W. Edwards Deming, a statistician from the United States. Deming was, and is, a proponent of statistical process



control as a means to insure "quality" in manufacturing products. His theories and principles soon spread throughout Japan's industrial sector and have formed the basis for much of the reputation and success Japanese businesses have had for producing "quality" products. In fact, the Japanese government has established an award in his honor, called the Deming Prize, which is awarded yearly to those companies with the best "quality" programs. The Deming Prize is, of course, highly coveted throughout Japan.

Although Dr Deming has been well known in Japanese business circles since 1950, he has been a relative unknown in the United States. In 1980 that began to change. The National Broadcasting Company (NBC) aired a documentary that year called "If Japan Can, Why Can't We?" This documentary featured Dr Deming and his quality/management principles. From that point Deming's reputation and philosophy began to spread throughout American business circles.

What Deming and other quality "gurus" such as Dr J. M. Juran and Mr Phillip Crosby have to say is that American business practices are, basically, obsolete. Deming's philosophy and principles stress the value of the employee to any organization, the responsibility of management to both the employee and customers in creating a successful organization and, that, given the proper tools and

guidance, a return to product "quality" in American businesses is the key to their sustaining competitiveness.

Specifically, Dr Deming focuses his "prescription" for American businesses on what he calls his 'Fourteen Points'.

These are:

1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy (of accepting only quality products, service, etc.)
3. Cease dependence on mass inspection.
4. End the practice of awarding business on price tag alone.
5. Improve constantly and forever the system of production and service.
6. Institute training.
7. Institute leadership.
8. Drive out fear (by employees of suggesting, improving work procedures, etc.)
9. Break down barriers between staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.
11. Eliminate numerical quotas.
12. Remove barriers to pride of workmanship.
13. Institute a vigorous program of education and retraining.
14. Take action to accomplish the transformation (i.e., for a nucleus of managers and employees to institute quality improvements.) (17: 34)

Beyond his Fourteen Points, Deming argues against such management practices as emphasizing short term gains over

long term organizational health, excess movement of management personnel, managing on figures alone and annual evaluations of company personnel.

However, the core of Deming's philosophy regarding "quality" is that it is a process not a product. He emphasizes that "quality" must be institutionalized and refuses to help a company unless top management is committed to the "quality" improvement process. He stresses that the new way (of quality improvement) is to inspect good quality in, not bad quality out. He insists on top management involvement because "Only management can change the system. Workers work within a system that-try as they might-is beyond their control. It is the system, not their individual skills, that determines how they perform." (18:51)

In improving product "quality" Deming and his colleagues each stress the use of statistical methods to identify variations in accepted standards. They emphasize thorough training of management and employees in the use of Statistical Process Control (SPC). Among the statistical tools used to improve quality performance are: 1) the Pareto Chart which ranks problems from most to least serious and allows management and employees to concentrate on the most serious problems which, if solved, would provide the biggest benefits. 2) Flow Diagram of the Process simply drawing a step by-step picture of the entire

process. 3) Cause-and-Effect Diagram-enabling workers to get to the root of a problem rather than treating symptoms. 4) Histogram-a portrayal of variations in a process allowing them to be compared to specifications. 5) Median and Variation Chart which allows everyone a quick picture of variations occurring in a process. 6) Scatter Diagrams which often show some characteristic of a process is unexpectedly related to some other characteristic. (19:198) Each of these statistical tools is fundamental to improving the "quality" process and is part of the training and education of all managers and employees involved in improving "quality".

The payoff from improved "quality" according to Deming, Juran, et. al., is improved productivity and the associated financial benefits of producing products at a lower (i.e. competitive) cost. The key, however, is the active involvement and support of all employees in the organization. Their creative talent and knowledge are the basis for improved productivity and "quality". An example of the benefits of tapping the creative potential of employees is drawn from Toyota, one of Japan's leading automobile manufacturers. Several years ago there were 859,039 suggestions for improvements submitted by Toyota employees. Of these, 94 percent were adopted and implemented. Toyota's auditors verified over \$30 million in savings from these suggestions alone! (20:114) In their

book, In Search of Excellence, Peters and Waterman describe excellent companies as having a sincere "respect for the individual." This respect and a penchant for "quality" and service are the hallmarks of organizations they describe as excellent.

To achieve organizational excellence, Dr Joseph Juran, like Deming, stresses upper management involvement and support. In a speech to a Defense Logistics Agency (DLA) sponsored conference on "quality" in 1982, Dr Juran stated that the United States was facing a gathering crisis in product "quality" and that our leadership in "quality" was eroding. (21:1) His basic definition of "quality" involves a product's "fitness for use." He defines this as "...the extent to which the product successfully serves the purposes of the user." He further defines the "quality" function as "the entire collection of activities through which we achieve this fitness for use, no matter where these activities are performed." In his DLA speech he urged upper managers to make three major breaks with tradition in order to have a strong and viable "quality" program. His three breaks with tradition are:

1. Launch a program of annual improvement in quality: improvement this year, next year, the following year and forever.
2. Undertake a massive program of training so that the entire management team, not just the quality department, is trained in how to attain, control and improve quality.

3. "Hands-on" leadership by upper management - a personal review by upper managers of the company's approach to quality so as to establish new policies, goals, and plans. (22:1)

Placing great emphasis on proper and thorough training in "quality" principles, Dr Juran said that the Japanese began formal training of their managers, at all levels, in the early 1950's. Ten years later they had the best trained managers on earth with respect to managing for "quality". He concluded that there was no way for American companies, with only 5% of their managers trained in "quality", to compete with Japanese companies which have virtually 100% of their managers trained in "quality" disciplines. (23:9)

In summary, the "quality" philosophy of Drs Deming, Juran and others are finally taking hold in American industry. Driven by a declining market share and a search for increased productivity at a more competitive cost, American businesses are listening to and heeding the need for improved "quality" throughout their organizations. Enlisting the full support of all levels of management, tapping the creative potential of employees, viewing "quality" as a process, not a product and insisting on "quality" as a matter of course are the basic principles underlying the "quality" revolution. Unlike previous management "fads" such as Management By Objective (MBO) and

Participative Management, the principles of the "quality" revolution are proving their worth in American businesses.

The proof of their worth, though, is in results and although there are numerous examples to choose from, the following will illustrate what implementing "quality" has meant to several well-known companies.

This Chapter began with a quote from Ford Motor Company, "Quality is Job 1!" Those words are more than a commercial slogan as evidenced by the increasing customer satisfaction and market share of Ford products. According to the influential automobile Customer Satisfaction Index (CSI), Ford leads all other American automobile companies in the quality component of the index by a substantial margin. The average score of Ford products was 107. However, Japanese automobiles averaged a score of 134. (24:34) Beyond statistics, the "quality" values and philosophy espoused by Deming, Juran, et al, have become part of the company "culture" at Ford. In fact, new car booklets provided to each new car buyer of a Ford automobile or truck outline the "quality" principles at Ford: Quality comes first, customers are our focus, continuous improvement, employee involvement, etc.

The "quality" program manager of the Ford assembly plant in St. Louis, Mo., (maker of the Ford Aerostar) recently spoke at a Total Quality Management (TQM) Conference sponsored by Military Airlift Command (MAC). He

stated that the Ford Aerostar was recently voted "Best In Its Class" and attributed it to the implementation of TQM at the assembly plant in 1984. In the same speech he went on to say that Ford hired Dr Deming as a consultant to improve their "quality" and market share. The program he instituted included top management commitment, extensive training of all employees, human relations, and management-by-facts using statistical process control techniques and results. He stressed the "100% buy-in from the top down" as absolutely vital to the success of instituting the change in "quality" management and philosophy. The results of those changes at Ford speak for themselves and provide an example of what reorienting the American view of management can accomplish.

Sony Corporation of America is another example of what the "quality" revolution is all about. According to Sony's Chairman, Akio Morita, "at Sony's plants in San Diego and Dothan, productivity has risen steadily, so that now it is very close to that of the factories in Japan." (25:38) Matsushita of America is another example. Statistically, in the past 5 years the number of defects per 100 television sets produced by Matsushita's American workforce was reduced from 140 per 100 sets to 5, 90 day complaints were reduced from 70 percent to 7 and personnel turnover dropped from 30 per year to 1! (26:9) Peters and Waterman state that there is no "Eastern Magic" or Japanese



culture base responsible for the improvements noted in these American plants. The "quality" and management principles learned from Dr Deming and his colleagues are responsible.

The costs of implementing these principles are minimal. Quality Circle magazine estimates the Return On Investment (ROI) of instituting Quality Circles to be between 5 and 8 to 1. (27:31) Rolls Royce's Aero Division, makers of jet engines, estimated a savings of 525,000 British Pounds in a 30 month period. Part of that savings resulted from reducing defects in complex welding processes from 24% to 1.8%. (28:7) Waters, in Thriving on Chaos, simply states, "where quality goes up, costs go down. Quality improvement is the primary source of cost reduction".

In summary, the "quality" revolution has caught on in American business. The realization that the old management style was no longer working, that American businesses were losing their competitive advantage to companies that stressed people as their most valuable resource and total involvement in continually improving "quality" provided a powerful incentive to adopt these "new" principles. And, not surprisingly, the "new" principles are proving their worth. At Ford and Sony America, as well as many other American companies, adoption of the "quality" philosophy has increased their market

share and totally changed the perception of what American management and workers can accomplish. Lastly, the cost of this adoption has been minimal. The following quote from In Search of Excellence sums up the "new" philosophy:

"There is good news from America. Good management practice today is not resident only in Japan. But, more important, the good news comes from treating people decently and asking them to shine, and from producing things that work...A numbing focus on cost gives way to an enhancing focus on quality..."  
(29: XXV)

## CHAPTER IV

### DOD BUYS INTO QUALITY

On August 18, 1988 the Secretary of Defense, Frank C. Carlucci, formally announced that the Department of Defense would implement the Total Quality Management (TQM) concept throughout all DOD activities. (30) In the news release that accompanied the announcement, Dr Deming was acknowledged as the individual who developed the concepts upon which TQM was based. The announcement went on to briefly describe "quality" as a process, not a product, that it would require a "total cultural change" in DOD's traditional approach and that the Secretary and senior leadership viewed TQM as a top priority for DOD.

In addition, a TQM Master Plan was published at the same time which outlined the concept, methodology and short, mid, and long range goals for implementing Total Quality Management within the Department of Defense. The Master Plan stated that TQM applies to all products and services of DOD and affects everything it does, produces, or procures. In short, the Master Plan was the first formal step taken by the senior leadership of DOD to implement the cultural change required by the TQM concept.

This formal adoption of TQM as Department policy was not the first on "quality" that Secretary Carlucci had announced. In March of 1988 he had signed out a formal DOD

Posture Statement on Quality. That Posture Statement is  
inserted below.



THE SECRETARY OF DEFENSE  
WASHINGTON, THE DISTRICT OF COLUMBIA



## DoD POSTURE ON QUALITY

- *Quality is absolutely vital to our defense, and requires a commitment to continuous improvement by all DoD personnel.*
- *A quality and productivity oriented Defense Industry with its underlying industrial base is the key to our ability to maintain a superior level of readiness.*
- *Sustained DoD wide emphasis and concern with respect to high quality and productivity must be an integral part of our daily activities.*
- *Quality improvement is a key to productivity improvement and must be pursued with the necessary resources to produce tangible benefits.*
- *Technology, being one of our greatest assets, must be widely used to improve continuously the quality of Defense systems, equipments and services.*
- *Emphasis must change from relying on inspection, to designing and building quality into the process and product.*
- *Quality must be a key element of competition.*
- *Acquisition strategies must include requirements for continuous improvement of quality and reduced ownership costs.*
- *Managers and personnel at all levels must take responsibility for the quality of their efforts.*
- *Competent, dedicated employees make the greatest contributions to quality and productivity. They must be recognized and rewarded accordingly.*
- *Quality concepts must be ingrained throughout every organization with the proper training at each level, starting with top management.*
- *Principles of quality improvement must involve all personnel and products, including the generation of products in paper and data form.*

*Paul Oliver*

The Secretary's Posture Statement on Quality and announcement that DOD would implement TQM were the official beginnings of TQM within the Department. However, many organizations had been using elements of Total Quality Management for years. In 1987 the Logistics Systems Analysis Office, within the Office of the Deputy Assistant Secretary of Defense for Logistics, was tasked to study which DOD organizations or activities were using Statistical Process Control (SPC) techniques as part of their "quality" program. The study found SPC being used throughout the Department in both the Services and Defense Agencies. It also found that the potential for significantly wider use was "almost unlimited". Within the Air Force, Air Force Logistics Command (AFLC) and several operating commands (MAC, TAC, and SAC) were identified as using SPC in varying degrees. AFLC, with its extensive maintenance and distribution activities, was most heavily involved.

Also in 1987 the new Assistant Secretary of Defense for Production and Logistics, Dr Robert B. Costello, echoed his support for the "quality" crusade within DOD. He stated that "quality" had a major impact on logistics and that "the higher quality of a weapon, the shorter its logistics chain...it's easier to maintain in the field, which improves our readiness." (31:40)

By 1987 organizations throughout the DOD were beginning to join the "quality" revolution. Senior leaders were speaking out on "quality" and calling for a change in the traditional approaches used in the past. Within the Air Force, the assignment of General Alfred G. Hansen to command the Air Force Logistics Command began a major leap forward in applying the TQM principles to all elements of AFLC.

General Hansen saw TQM as a "powerful solution to a very tough set of problems." He set about changing the traditional culture of the command's management philosophy--to view "quality" as a continuous process rather than a result of a process. After studying and reviewing the "quality" programs at various DOD organizations such as the Navy's North Island Rework Facility and the commercial programs at Lockheed, IBM and General Motor's Inland Plant, he directed his command to develop a program which contained aspects of several successful "quality" programs. The result is AFLC's QP-4 Program--Quality is People, Process, Performance and Product.

In each of the five Air Logistics Centers (ALCs), as well as at the headquarters, a senior manager was charged with implementing and promoting the QP-4 program and "quality" concepts throughout the ALC. Senior leaders at the highest levels within the command attended seminars

and other training programs on QP-4. Teams composed of production workers and other experts called Process Action Teams (PATs) were formed at all levels and organizations to identify and solve problems associated with particular processes they worked with, people were trained in Statistical Process Control and the "quality" concepts of Deming, Juran, et al. In short, seeing TQM and increased "quality" as the only way the Command could compete in the austere fiscal environment facing the Air Force and DOD in the late 80s, General Hansen began the task of changing the traditional approaches of providing logistics support to a new and innovative way emphasizing "quality" at all levels in an organization of over 85,000 people. The task was formidable but is already showing results.

The following examples will illustrate the type of results that AFLC is seeing within its first year of implementing QP-4. At Oklahoma City Air Logistics Center a Process Action team (PAT) was formed in the Engine Division to improve the accuracy of the supply function, called the Maintenance Inventory Control (MIC), which supplies parts to the engine line for overhaul and buildup of jet engines. After analyzing the problem, the PAT recommended the MIC be subdivided into smaller units each responsible for supplying a particular engine. The results of the subdivision improved the MIC accuracy rate from 50% to 95%. At Ogden Air Logistics Center installation requests from



the Directorate of Maintenance divisions were taking as long as 200 days from initiation to approval. This severely slowed needed equipment replacement and effected productivity within the divisions. A Process Action Team was formed to study this problem and found that all requests received the same priority. The Team developed a priority system, implemented it and the average time has now dropped to six days per request. Another PAT at San Antonio Air Logistics Center was formed to determine why the replacement rate of a particular part had significantly increased on the F100 engine. The Team thoroughly analyzed the problem, determined the cause, developed solutions (local manufacture of the defective part and development of a special removal tool), and implemented them. The immediate result was averting a work stoppage on the F100 engine line. Overall, however, the Team's actions reduced removal rates of the part by 60% resulting in a first year savings of \$164,479.30. (32)

The examples cited above illustrate something that American managers, in general, seem to have forgotten over the years—that an organization's own people are the key to its success, strength and productivity. Peters and Waterman said that "Treating people not money, machines, or minds—as the natural resource may be the key to it all." Further, Robert L. Shook in his book about the Honda's success in America said: "A definite correlation

exists between the quality of a company's products and the pride of a company's employees." (33:112) In AFLC, as in many other DOD activities, both the product and the employees are showing these statements to be true.

The next question is: Where does the Air Force go from here? If TQM is working in parts of DOD and its AFLC counterpart, QP-4, is showing positive results within that command, what about the rest of the Air Force?

Specifically, what about the operational commands and wings of the Air Force where most of the people are and where, theoretically, the greatest opportunities for positive results are? The following chapter will suggest how the Total Quality Management concept could be applied to the Air Force's flightline maintenance organizations.

CHAPTER V  
IMPLEMENTING TOTAL QUALITY MANAGEMENT  
AT THE FLIGHTLINE LEVEL

Chapter 1 provided a general overview of what Air Force manuals and regulations say about "quality" and the "quality" program governing aircraft maintenance at the flightline level. In sum, the Air Force's "quality" program has changed little since its inception, is an after-the-fact oriented effort as opposed to a process-oriented one, and "quality" of Air Force weapon systems and equipment appears to be a by-product of the system, not a basis of it.

Next, the history and roots of the so-called "quality revolution" were discussed. The theories of Deming and Juran were highlighted and the application of their concepts and philosophies to selected American businesses were discussed. The successes of organizations adopting the new "quality" principles were also illustrated. The basis of those principles are: people, training, process and leadership.

Finally, the previous chapter explained how the Department of Defense has joined the "quality revolution". In 1988, the Secretary of Defense signed a Posture Statement on Quality and instructed all DOD agencies and departments to adopt Total Quality Management as "the vehicle for attaining continuous quality improvement in our

operations, and as a major strategy to meet the President's productivity objectives under Executive Order 12522." The Air Force Logistics Command has implemented their program, QP-4, to spread the new "quality" philosophy throughout that command. Although not mentioned previously, the Air Force Systems Command has strongly adopted TQM in an effort to improve efficiency and effectiveness of their acquisition of Air Force systems. However, the major operational commands have yet to implement TQM.

This chapter will propose how to implement the TQM philosophy at the Air Force flightline level within the maintenance complexes of Air Force wings. While this proposal is not the only solution to implementing TQM on the flightline, it is one that has been developed after discussions with Air Force senior leaders who have served as Deputy Commanders for Maintenance, Wing Commanders, deputy Chief of Staff Logistics on major headquarters staffs, and, in the case of General Alfred G. Hansen, one who is currently serving as Commander of AFLC and has served in all the above positions. Since the focus of this paper is on "quality" at the flightline level, that's where proposed actions will start. However, we recognize that the Major Commands and Air Staff set the basic policies and guidance for organizational and intermediate maintenance. After proposing a program for DCMs, the paper will go back up-channel and recommend higher headquarters actions to

implement "quality" as an Air Force-wide process. At all levels, Deming's principles can be applied with common-sense programs.

Deming's first principle is to "create constancy of purpose for improvement of product and service." DCMs can create that environment for improvement by establishing realistic, yet challenging goals for their organizations. Examples are: Reduce repeat/recur rates by 10% over the next two years; lower the abort rate by 2% and maintain the new lower standard over a one year period; meet all daily training sortie requirements with on time taxi and takeoff times at a rate of 98%; reduce delayed discrepancies by 25% over the next 12 months; win the command-level Daedalian trophy. These goals are not new or unusual. However, what is important is for DCMs to recognize that they have the responsibility and the power to effect the direction their organization takes. Solid goals and high standards give an organization that direction. The old saying, "if you don't know where you are going, any road will do" is especially true for large organizations like a wing maintenance complex. The DCM and his squadron commanders must first create constancy of purpose in order for improvements in service to occur. It sounds like "motherhood and apple pie" so far, but please continue.

Deming's second principle is to "adopt the new philosophy" of accepting only quality work. Positive

programs, including rewards for meeting and exceeding the goals established for an organization, can go a long way toward achieving this principle. Based on the authors' years of experience on Air Force flightlines, DCMs and squadron commanders too often focus on "negative" motivators in order to coerce their people to perform good work. Many old-school leaders labor under the perception that "fear" is the best motivator. If Deming and Juran are right, the negative motivators must be discarded to make way for positive reward and incentive programs. The "new philosophy" of positives can be ingrained in the organization by involving the workforce and key supervisors in helping to establish common goals. For example, if the DCM develops his goals in isolation from his commanders and the technicians who must carry them out, those goals will remain only his, and his organization will attempt to accomplish them begrudgingly. In order to get an honest, dedicated effort toward surpassing unit goals, the DCM must get people directly involved in developing those goals and standards. It really works. Both authors of this paper had the privilege of helping their maintenance organizations win either the command's or the Air Force Daedalian and Department of Defense Phoenix trophies for maintenance excellence. These awards represent the absolute top awards for aircraft maintenance and were achieved by individuals working together toward common

goals. Those goals were established and accepted by all the people, who then came to believe that their efforts to perform "quality" maintenance in every task would help them win the top honors. In effect, they adopted the "new philosophy" as the daily standard for performance. That "new philosophy" permeated the maintenance complex and championship honors followed.

Deming's third principle says to "cease dependence on mass inspection." Early in this paper we pointed out that most Air Force maintenance organizations do a lot of inspecting, with the belief that "quality" results from following technical data to the letter, and has nothing to do with the technician's attitude toward the job. Inspections occur after the work has been performed. In organizations with the "new philosophy", most workers will be motivated to perform top-quality work every time, the first time. However, in many maintenance complexes, inspections have become indispensable because the inspectors find problems with almost every job. These organizations have come to rely on QA inspectors for "quality" at the wrong end of the maintenance process. DCMs must have the foresight, determination, and strength of character to create the atmosphere in their organizations that will allow them to reduce reliance on inspectors and inspections. One way to do this is to make

the reduction of inspections one of the principle goals, and one of the principle rewards for the people.

In industry, reduction of inspections is often used as a reward. At Lockheed, for example, work centers that typically produce error-free work are rewarded with fewer or no inspections. Their shops are marked off with a special paint of a different color from less effective shops as a means of identifying outstanding performance areas. This system serves to highlight the good, and gives work centers that are performing at a lower level of "quality" something tangible at which to shoot. General John Nowak, Director of Maintenance for AFLC, told us that his command has adopted this philosophy as a way to let the technicians know that their leaders trust them to do "quality" work. General Nowak and his maintenance leaders and supervisors throughout the command are improving their quality while relying less and less on designated quality inspectors. Some tasks performed in aircraft maintenance are considered critical to flying safety, and, because of this criticality are still inspected. However, instead of using QA inspectors, AFLC now uses other properly trained and experienced technicians to inspect the work of their co-workers. This approach gives each worker a direct stake in the "quality" of his work, and it demonstrates the trust and confidence that management has in the workforce. One of AFLC's goals is to reduce designated "quality"



inspectors to a minimum, relying instead on certified production workers to verify work in critical areas.

On operational Air Force flightlines, DCMs can improve "quality" by gradually weaning their organization of inspections. This is not a recommendation for doing away with all inspections. However, the reduction of inspections can be used as a reward, an incentive for maintenance people to shoot for. The better "quality" work that the people perform, the less QA should inspect them. In the long run, technicians in "new philosophy" maintenance units will perform to the highest standards of excellence because they will want to, and because they feel responsible for the work they produce. They will reward the organization with top-quality work because they will appreciate their leaders' trust in them, and they will recognize that they have an important stake in the "quality" performance of their organization.

Deming's fourth principle, "end the practice of awarding business on price tag alone", doesn't apply as well to flightline maintenance as it does to AFLC and Systems Command. The idea behind the words still has important meaning at wing-level where the DCM can make critical decisions about how to direct his peoples' efforts. Each DCM must be careful not to focus all his attention on sortie production, or exercise and inspection preparation, at the expense of teaching his people to

perform "quality" maintenance. Ignoring "quality" is like making decisions based only on the low bid.

Next, Deming says to "improve constantly and forever the system of production and service". This goes back to goal setting, and his first principle, committing the people and the organization to excellence in all aspects of maintenance. The biggest hazard for any organization is to float along in mediocrity, without a strong sense of purpose or direction. Such units have no goals. In some cases, these are yesterday's champions, organizations that sought and achieved high goals, and then, having achieved their goals, leveled out to mediocre standards of "quality". The key to "constantly improving" is to adjust organizational goals as the unit approaches them. One suggestion is that each DCM establish a small planning group, led by his assistant or key squadron commanders, to review progress toward those goals the organization is committed to, and to develop new goals before the old goals are reached. This approach allows the unit to continue to improve, to continue to strive for higher "quality", and in this way, to achieve Deming's principle of constant improvement.

One of the best ways to constantly improve is to strongly implement Deming's sixth principle, which is to "institute training". "You only get one chance to make a first impression" is an old saying that is particularly

true of Maintenance Training. Training is one of the first stops for people when they arrive at their new wing. As previously mentioned in chapter 1, MAC assigns new arrivals to Maintenance Training for the first four months, after which they are "trained" properly for their shop or flightline duties. Maintenance Training is the ideal place for DCMs to focus on "quality", especially since it is the first impression of an organization for all the new people. Each maintenance training class should start with heavy emphasis on each individual's responsibility to perform top "quality" work on every task. The key is to teach new and old people the importance of doing the job correctly, with personal pride, and with a sense of ownership, the first time each technician works on a task. Training should show the people that there is no time to do the task over. Doing it right the first time requires a clear understanding, and a personal commitment, to "quality". That commitment can best be made with concentrated training from the very first time a new technician sets foot in the training classroom.

In addition to teaching technicians about "quality", leaders and supervisors must learn, and be committed to "quality" and its importance in the accomplishment of unit goals. Most technicians perform to the level of their leaders' expectations. Simply put, to get a championship outfit, expect championship

performances. Generally, people will produce commensurate with the level of demands. Demand "quality", and the people will produce "quality" providing they and their supervisors have been trained properly.

This fits perfectly with Deming's seventh principle, "institute leadership", because leadership sets the direction and pace in an organization. Commitment to "quality" is the most important factor for leaders to focus on. Juran makes "commitment to quality" a prerequisite for even working with companies who want to improve their productivity through better "quality". In the Air Force today, General Hansen and General Nowak in AFLC, and General Randolph in AFSC, have a commitment to "quality" and are working hard on training their leaders, supervisors, and maintenance technicians in "quality" principles and techniques. Their efforts, like those in industry, are designed to change the culture and work-ethic in their commands so that "quality" becomes the norm, not the exception. We are not naive enough to believe that changing the work habits and culture of an organization is a simple task. Real, long-term, lasting changes take a true leadership commitment from DCMs and their people.

Deming's eighth principle calls for driving out fear in people, fear of suggesting changes that will make maintenance processes better and more efficient. There are several programs in-being today that encourage suggestions.

We think these programs (MIP, CORE, product improvement program, and suggestion program) are sufficient, so there is no reason to re-invent the wheel. Review these programs to see if they are vital and meeting the organization's needs. Many times, the key to making these programs work is to put the right leader in charge of them. The leader creates a positive, or a negative image for the program. The idea is to give people a stake in the organization through active participation in its improvement.

In addition to the standard Air Force suggestion programs, AFLC has instituted a new one as part of their "new philosophy". This program was described in Chapter 3 and involves forming PAT (process action teams) teams. DCMs can use the same concept, focusing the efforts of these teams to review problem areas, or maintenance processes, and find better ways of doing business. QA inspectors can serve as team leaders to look into each process identified by the DCM and his staff. Each team should be composed of flightline and shop technicians in order to involve them in finding better ways to do the job. Their involvement helps make them part of the solution and will make suggestions easier to implement.

Formation of PAT teams will also help breakdown many barriers that may exist between the workers and the DCM staff. This is Deming's ninth principle and is a critical one since Maintenance Training and QA are two of

the most important staff functions that have almost constant interface with flightline technicians. Avoiding the "we/they" syndrome in large maintenance organizations is absolutely necessary to ensure success.

Next, Deming says to "eliminate slogans, exhortations and targets for the workforce". Eliminating slogans will be enthusiastically accepted by DCMs. They should periodically go through the shops and see what kind of slogans, sayings, bulletins, etc. accumulate, and have them removed. Eliminating targets may run against the grain of most DCMs, however. Many targets are set by the major commands in an effort to standardize. These targets serve as command goals over which wing-level people have little say. Deming's premise is to stop worrying about numbers, piecemeal if you will, and concentrate on making processes more efficient. For the DCM, try to eliminate programs like the old "Zero Defect" program and, instead, develop realistic workcenter goals and standards to shoot for.

Next, "remove barriers to the pride of workmanship". This can be done by involving the people in all aspects of maintenance production including goal setting, PAT teams, recognition programs, training syllabus development, etc. The more involved the people are, the more pride they will have in their organization and the more "quality" they will put into every job. Take away the

inspection crutch and replace it with properly trained technicians who know the principles and values of performing top-quality maintenance, and the organization is on the way to being great.

The ideas of Deming, Juran, Hansen, and Nowak have been used successfully in industry and in AFLC to bring "quality" to the maintenance work place. These same ideas can be practically and thoughtfully applied to flightline maintenance organizations in the Air Force today. It takes study, total commitment to "quality", and the dedication and leadership to make positive changes happen. By applying these principles, "quality" can be made a lasting process that will help keep the operational Air Force ready for tomorrow's challenges.

Headquarters Air Force and the major commands must also become directly involved in order for "quality" maintenance to become a permanent change in the basic "culture" of our Air Force. First, AFR 66-1 needs to be updated to include Total Quality Management concepts as directed by the Secretary of Defense in his policy statement on "quality". This basic 66-1 guidance to the major operational commands must set the tone for commitment to "quality", just like industry. Commitment needs to be on paper, in revised guidance to the field, and in the attitudes of senior Air Force logisticians. Their ability to convince maintenance leaders that "quality" is the best

investment in excellence for any organization is key to the success of the program. "Quality" needs to be one of the first requirements listed in AFR 66-1, as a responsibility for every leader described in that regulation. In addition to updating regulations, Air Staff maintenance leaders should include "quality" at every professional gathering they attend. Their honest commitment to raising the overall production and performance of maintenance units in all the commands will set the stage for a gradual and permanent change in the way maintenance people view "quality". But writing regulations and talking about "quality" are only part of the actions needed at the Air Force level.

Long term "quality" in aircraft maintenance can be achieved only by properly teaching each technician the "quality" way to do the job. Training about "quality" must start in the technical schools and be included in each maintenance class. The technical training centers must teach their own instructors about "quality", perhaps hiring industry consultants to create an initial level of understanding concerning "quality" principles. Once the instructors know about "quality", they should begin revising course material so that "quality" is a focus in each class taught in the training centers, and in the Field Training Detachments world-wide. This focus on teaching and stressing "quality" from the very first will get new



technicians started with a keen awareness of their responsibilities to perform top "quality" work on each task. They will also be taught to understand that "quality" work takes less time and energy over the long run than does sloppy work which must be repeated.

The major commands should revise their regulations in response to new Air Force guidance, with a special focus on putting "quality" up front in all maintenance directives. Ongoing efforts to work with Air Training Command to develop longer, more comprehensive maintenance training courses, with a special focus on "quality", should be continued. This effort, to develop "four-level" technicians, who come out of technical training with an in-depth knowledge of the maintenance skills required in their specialty, can pay long-term dividends to the Air Force. Properly trained technicians, with a clear understanding of "quality" and its benefits, can be made productive on the flightline much more quickly than today's lesser trained technicians. Like their Air Staff counterparts, major command maintenance leaders must be committed to "quality" maintenance production, and become outspoken advocates. The major commands should encourage units to focus on "quality" by setting high standards, rewarding the best units with fewer inspections, and by reducing reliance on QA-generated statistical products. Guidance in command regulations can set the stage for DCMs to build "quality"

training programs at the local level, using command-generated training models. "Quality" must be first in every command maintenance action.

This paper has presented some suggestions for DCMs, major commands, and the Air Staff to develop stronger "quality" programs throughout aircraft maintenance organizations in the Air Force. Now is the time to take full advantage of the solid work that people like Deming, Juran, Peters, and Hansen have done, in an effort to ingrain "quality" into the daily performance of each technician. The results of a strong "quality" orientation, from first training class to leadership on today's flightlines, will be safer, more efficient, and more timely maintenance production. Top-quality maintenance will be an important factor in offsetting the diminishing Defense budgets that began three years ago, and are certain to continue in the near future as the United States attacks its immense federal deficit.

## CHAPTER VI

### RECOMMENDATIONS

Our research leads us to the conclusion that "quality" initiatives being used in industry today can be applied on Air Force flightlines. The proven ideas of Deming, Juran, Crosby, and others form a basis from which to develop "quality" programs that will benefit the Air Force, while costing next to nothing.

We recommend the following actions be taken by the Air Staff:

1. Establish a focal point in AF/LEYM to formulate comprehensive "quality" guidance.
2. Review all guidance contained in AFR 66-1 series publications and bring "quality" to the forefront as a requirement at all levels of maintenance leadership in the Air Force.
3. Initiate changes to AFR 66-1 so that the major commands can begin reviewing, and improving, their regulations in light of proven methods to improve the "quality" of maintenance.
4. Conduct a thorough review of the initial maintenance training provided to recruits to ensure that "quality" principles are emphasized, and taught in every class, in every technical training center.
5. Seek training in "quality" for all action officer's assigned to AF/LEY, so they may better understand

that "quality" principles can be learned, and those principles applied, when formulating maintenance policies for the Air Force.

We recommend the following actions be taken by each major command, pending Air Staff guidance:

1. Establish a command focal point for developing "quality" programs within the command.

2. Review, with Air Training Command, all initial courses being taught in the technical training centers and Field Training Detachments, and make changes to emphasize "quality" training in each course.

3. Provide interim guidance to the DCMs on "quality" initiatives to improve local maintenance training courses, with special emphasis on "individual technician" responsibilities for performing "quality" work on each job.

4. Review command standards and QA inspection guidance in an effort to reduce reliance on "inspecting-in" "quality" and increase reliance on "building in" "quality".

5. Review command Inspector General and Maintenance Standardization team guidance, emphasizing "quality" performance by technicians rather than QA programs as a means of assessing each unit's "quality".

6. Reduce the number of command-level inspections performed on units which historically meet or exceed standards. Less inspection is a tangible reward for superior maintenance performance.

7. Turn Air Staff guidance into positive changes in command maintenance regulations.

We recommend the following "quality" checklist for DCMs, based on principles used by Deming and others:

1. Recognize that leadership sets the standards for the organization.

2. Involve the workers in developing unit goals.

3. Accept only "quality" work. Don't walk by a malpractice.

4. Reward excellence with positive programs, like the TAF "UTE Day" program.

5. Reduce inspections. Put those experts back to work on the line.

6. Focus on constantly improving the organization by periodically updating goals.

7. Teach "quality" in every training class.

8. Expect excellence from your people.

9. Encourage new ideas and solving problems through Process Action Teams and existing suggestion programs.

10. Eliminate meaningless slogans.

11. Instill a "sense of ownership" and a "pride of workmanship" throughout the organization.

12. Become a "quality" zealot.

Adoption of these recommendations will help move the Air Force and its' maintenance organizations toward

higher "quality" workmanship, and, as a result, better equipment performance. Joining the "Quality Revolution" is a must if we are to improve the combat capabilities of Air Force weapon systems as we enter the next decade.

## LIST OF REFERENCES

1. Air Force Regulation 66-1, Maintenance Policy, Washington D.C.: Department of the Air Force, GPO, 21 Apr 83.
2. Ibid p.11.
3. Ibid p.11.
4. Ibid p.21.
5. Multiple Command Regulation 66-5, Combat Oriented Maintenance Organization, Washington D.C.: Department of the Air Force, GPO, 31 May 85.
6. Ibid p.1-5.
7. Ibid p.2-1.
8. Ibid p.4-1.
9. Military Airlift Command Regulation 66-1, Maintenance Management Policy, Washington D.C.: Department of the Air Force, GPO, 22 Jul 83.
10. Ibid p.2.
11. Ibid p.4.
12. Air Training Command Regulation 66-1, Vol II, Maintenance Management-Aircraft, Washington D.C.: Department of the Air Force, GPO, 15 Mar 83.
13. Strategic Air Command Regulation 66-9, Vol I, Maintenance Management General Policy, Washington D.C.: Department of the Air Force, GPO, 30 Mar 84.
14. Ibid p.2-1.
15. Ibid p.4-1.
16. Strategic Air Command Regulation 66-14, Vol I, Readiness Oriented Logistics System, Washington D.C.: Department of the Air Force, GPO, 15 Jan 88.
17. Walton, Mary, "Deming's Parable of the Red Beads", Across the Board, Feb 87.
18. Ibid p.51.
19. Callaghan, Joseph M., "A Comic Book Approach to SPC", Automotive Excellence, Jun 85.

20. Suzawa, Shochi, "How the Japanese Achieve Excellence", Training and Development Journal, May 85.
21. Juran, J.M., "Upper Management and Quality-A New Direction". Speech to DOD Conference on Quality, Washington D.C., May 82
22. Ibid p.1.
23. Ibid p.9.
24. Peters, Tom, Thriving on Chaos--Handbook for a Management Revolution, Harper & Row, New York, 1987.
25. Naoto, Sasaki, The Japanese Approach to Product Quality, Its Applicability to the West, Pergamon Press, Ltd., London, 1984.
26. Peters, Thomas J. and Waterman, Robert H. Jr., In Search of Excellence, Harper & Row, New York, 1982.
27. Naoto, Sasaki, op.cit., p.31.
28. Ibid p.7.
29. Peters and Waterman, op.cit. p.XXV.
30. Hansen, Alfred G., General, USAF, Address to the Logistics R&D Conference, 1988.
31. Kitfield, James, "Costello's Quality Crusade", Military Logistics Forum, Sep 87.
32. AFLC/QP Staff Summary Sheet, "Good Examples of Quality Benefits", 17 Nov 88.
33. Shook, Robert L., Honda-An American Success Story, Prentice Hall Press, New York, 1988.